

5.0 DISCUSSION OF RESULTS

5.1 GEOLOGY AND HYDROGEOLOGY

Geology

The observed subsurface geology encountered in the soil borings beneath the site during drilling of three boreholes for triple nested well installations (P-1, P-2, and P-3). The Site is underlain by unconsolidated clayey silt, silty sand and to a lesser extent sand deposits. The upper 55 feet in borehole P-1 and the upper 63 feet in P-2 predominantly consist of dark colored fine sediments, rich in clay and silt. Lower intervals from 55 feet to 101.5 feet in P-1 and 63 to 102.5 feet in P-2 consist of coarser sediments, rich in silt and sand. First groundwater was encountered during drilling in boreholes P-1 and P-3, at approximately 60 feet and 63 feet bgs, respectively. The lithologic correlation between boreholes was not attempted, because all lithologic units to the total depth of boreholes were lens shaped and not laterally continuous, making correlation very difficult. Broken shell fragments in borehole P-1 at 48 feet and lens shaped lithologic units indicate fluvial influence on original playa marine deposits. A light olive brown, clayey silt layer was encountered in each borehole which was laterally extensive throughout the Site. This clayey silt layer is very hard, impermeable and was present at the termination depth of each borehole to approximately 102 feet bgs. This confining layer is most likely acting as an aquitard separating the upper water bearing zone from the lower water bearing zone.

The VOC readings obtained using an PID ranged from 1 parts per million by volume (ppmv) to 59 ppmv. Boring logs prepared by Earth Tech are included as **Appendix C**.

An east-west geologic cross section (A-A') depicting the subsurface geology encountered in selected borings is presented as **Figure 4**.

Hydrogeology

Based on the review of the groundwater flow map it indicates that on the day of the groundwater depth measurements (March 18, 2005), groundwater beneath the Site was measured at about 57-59 feet bgs and flows predominantly towards the south with an average hydraulic gradient calculated to be approximately 0.010 ft/ft (**Figure 5**). The groundwater level measurements measured in each of the triple nested piezometer (shallow, middle and deep) contained the same groundwater elevation. Therefore, the piezometers were installed beneath the site in the upper water bearing zone.

5.2 SOIL GAS ANALYTICAL RESULTS

The following sections summarize the results of the soil gas analytical program. A summary of the soil gas analytical results is included in **Tables 5A** and **5B**. The laboratory reports and chain-of-custody documentation are included in **Appendix F**.

5.2.1 VOC ANALYSIS USING EPA METHOD 8260B

The mobile laboratory detected 12 VOC compounds during the soil gas survey investigation out of 42 soil gas samples (including duplicates) collected and analyzed following EPA Method 8260B. VOC concentrations detected in soil gas ranged from 0.10 ug/L to 120 ug/l of TCE (SV-6-35 feet bgs).

The analytical soil gas mobile lab results are shown in **Table 5A**. The laboratory reports and chain-of-custody documentation from Jones Laboratories are included in **Appendix F**.

5.2.1.1 VOC Analysis Using EPA Method TO-15

Four soil gas samples (SV)) were collected in Summa canisters for analysis following TO-15. VOCs were detected in all 4 samples analyzed by EPA Method TO-15. The following table summarizes the minimum and maximum concentrations of detected VOCs by EPA Method TO-15. A total of 13 VOC constituents were detected in soil gas samples collected during this investigation. Analytical results for the TO-15 soil gas samples are shown in **Table 5B**. ATL laboratory reports and chain-of-custody documentation are included in **Appendix F**.

Summary of Detected VOCs in Soil Gas Samples (TO-15 analyses)
(Units expressed as ug/L=micrograms per liter)

VOCs	Number of Detections	Minimum Concentration (ug/L)	Maximum Concentration (ug/L)
Dichlorodifluoromethane	4	4.8	7.4
Ethylbenzene	4	0.72	2.1
1,1,2-Cl 1,2,2-F ethane	2	0.88	1.2
Methylene chloride	2	11	100
1,1-Dichloroethene	1	0.11	0.11
Cis-1,2-Dichloroethene	4	0.84	12
o-Xylene	4	0.26	3.3
m/p-Xylenes	4	0.81	11
Tetrachloroethene	4	1.7	19
Toluene	4	0.25	2.0
Trichlorofluoromethane	4	4.2	6.4
Trichloroethene	4	15	160
1,2,4-Trimethylbenzene	4	0.28	2.9

5.2.2 SOIL ANALYTICAL PROCEDURES

Off-site analytical services were provided by Advanced Technology Labs (ATL), a California state Certified Laboratory. The soil samples collected for analysis (including duplicates) were submitted to ATL for VOCs (EPA Method 8260B/5035) analysis.

5.2.3 SOIL ANALYTICAL RESULTS

A summary of soil analytical results is provided in **Table 6**. The laboratory reports and chain-of-custody documentation are included in **Appendix G**. The following discussion presents those compounds detected.

5.2.3.1 VOCs by EPA Method 8260B

A total of 67 soil samples were analyzed for VOCs, including 7 duplicate samples. Detectable VOCs were found in 2 most of the soil samples. **Figures 6, 7 and 8** shows the widely VOCs concentrations detected in soil samples collected from depths of 10 feet to 60 feet bgs. Figure 6 show the maximum VOC concentrations detected in soil at the 10 and 20-foot depths. Figure 7 show the maximum VOC concentrations detected in soil at the 30 and 40-foot depths. Figure 8 show the maximum VOC concentrations detected in soil at the 50 and 60 foot depths. The following discussion is based on the VOCs analytical results in soil.

- Trichloroethene (TCE) was detected in 55 soil samples with concentrations ranging from 4.8 ug/kg to 250 ug/kg in soil sample SB-1-30'.
- Tetrachloroethene (PCE) was detected in 43 of the soil samples with concentrations ranging from 4.6 ug/kg to 110 ug/kg in soil sample SB-37-35'. SB-11-45' is located at the V&A Car Wash on the south side of the UST and SB-2-65' (center of parking lot).
- Cis-1,2-Dichloroethene (c-DCE) was detected in 17 soil samples, and the detected concentrations ranged from 1.3 ug/kg to 140 ug/kg in soil sample P-2 at 40' (north side of lot).
- Trans-1,2-Dichloroethene (t-DCE) was not detected in soil samples
- Methylene chloride was detected in 3 soil samples with concentrations of 4.2 ug/kg, 8.1 ug/kg and 8.0 ug/kg in borings SB-3 at 40 and 50 feet, and P-1 at 50 feet, respectively
- BTEX and Methyl tert-butyl ether (MTBE) concentrations were not detected in any of the soil samples.

5.2.4 GROUND WATER SAMPLING RESULTS-VOCS

On March 18, 2005, twelve groundwater samples were obtained from the monitoring wells (MW-1 through MW-3) and the 3 triple nested (shallow, intermediate and deep) piezometers (P-1 through P-3). Samples were analyzed for VOCs by GCMS and fuel oxygenates according to EPA method 8260B.

Based on the results of water samples analyzed, they indicate that concentrations of the most widely detected VOCs such as trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (c-DCE), trans-1,2-dichloroethene (t-DCE), trichlorofluoromethane (TCFE) and chloroform were detected in most of the sampling locations ranging from 5.0 ppb to 5,300 ppb (**Table 7**).

- TCE concentrations ranged 46 ug/L to 5,300 ug/L (in well MW-1, highest VOC detected)
- PCE concentrations ranged from 12 ug/L to 250 ug/L
- Chloroform concentrations ranged from 8.2 ug/L to 37 ug/L
- c-DCE concentrations ranged from 5.3 ug/L to 48 ug/L
- t-DCE concentrations were detected in 2 wells (7.1 ug/L to 8.2 ug/L)
- Methylene chloride concentrations was not detected
- BTEX and fuel oxygenate concentrations were not detected

Figure 9 shows the most widely detected VOCs in water samples collected from the 12 sampling locations.

Figure 10 is an east-west cross-section showing the TCE, PCE and methylene concentrations detected in groundwater from 2 existing monitoring wells (MW-2 and MW-3) and from two triple nested piezometers (9 specific sampling locations) P-1 and P-3.

The VOC laboratory analytical results are summarized in **Table 7**. Laboratory reports and chains of custody for the groundwater data are presented as Appendix H.

6.0 HUMAN HEALTH SCREENING EVALUATION

6.1 INHALATION OF INDOOR AIR

Earth Tech conducted a preliminary health risk evaluation (HRA) on the shallow soil gas concentrations detected in the vapor phase from 5 feet to 30 feet bgs. VOCs in the subsurface, can migrate upward through the soil and enter into buildings, causing an unacceptable chemical exposure for building occupants. Based on the preliminary HRA results, the only chemicals that could pose a problem are TCE and PCE in soil-gas. If the maximum detected concentrations are located under the ECI industrial building, the cancer risk to on-site occupants associated with vapor intrusion may be as high as 7.1×10^{-5} . However, considering that the source was located in the ECI parking lot, the maximum VOC concentrations detected are most likely beneath the ECI paved parking lot, thus, giving a cancer risk estimate for soil and soil gas less than the DTSC target risk screening goal of 1×10^{-6} , which is within acceptable levels.

7.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

Based on the findings of the subsurface investigation, and the chemical analysis results of soil, soil gas and groundwater samples collected from borings/wells and from water samples collected from existing wells MW-1 through MW-3, Earth Tech concludes the following:

- Groundwater was encountered between approximately 56-60 feet bgs during drilling. Static groundwater was measured in the wells/piezometers ranging between 57 and 59 feet btoc. Groundwater was estimated to flow in a southerly direction through the Site with an hydraulic gradient of 0.010 feet per foot (**Figure 5**).
- Lithology beneath the site consists primarily of clayey silt, silt, silty sand and lenses of poorly graded sands. An east-west geologic cross-section showing lithology and groundwater levels are shown as **Figure 4**.
- Considering that the source was located beneath the ECI parking lot, the maximum VOC concentrations detected are most likely beneath the parking lot, thus, giving a cancer risk estimate for soil and soil gas less than the DTSC target risk screening goal of 1×10^{-6} , which is within acceptable levels.

Soil Gas

- A total of 6 soil gas locations were assessed and 42 soil gas samples collected. Soil gas results are summarized in Tables 5A and 5B. Low VOC concentrations were detected in shallow soil gas.
 - Higher VOC concentrations were detected in soil gas at deeper zones due to possible VOC migration from contaminated groundwater at approximately 58 feet bgs and impacting the soils beneath the Site.
 - Methylene chloride was not detected in any of the soil gas samples analyzed including in the confirmation TO-15 sample analysis (4 samples).

Soil

- A total of 67 soil samples were collected from 6 SB borings and three piezometers.
 - Low levels of VOC constituents were detected in shallow depths (10 to 20 feet bgs) across the Site (**Figure 6**). **Figures 7 and 8** shows the widely VOCs concentrations detected in soil from depths ranging from 30 feet to 60 feet bgs.
 - Methylene chloride was detected in 3 soil samples from boring SB-3 and from boring P-1 with a maximum concentration of 8.1 ug/kg, which is below the acceptable level of 21 mg/kg in soil, based on the EPA Industrial PRG value).

- The previous identified VOC (TCE and PCE) concentrations detected in soil from previous investigations were not confirmed at the Site during this investigation.
- The VOC concentrations (TCE and PCE) detected in soil from 30 to 60 feet bgs are most likely attributed to VOC migration from contaminated groundwater migrating upwards and impacting the soils beneath the Site. Furthermore, no concentrated sources of VOCs originating from the Site are indicated by the soil samples.

Groundwater

- Groundwater samples were collected from the 12 groundwater monitoring sampling points (3 wells and 3 triple nested piezometers).
 - Groundwater samples analyzed for VOCs show that PCE and TCE were detected in the 3 wells and 9 piezometers. The VOC concentrations are shown on **Figure 9**
 - Methylene chloride concentrations were not detected in the three existing wells MW-1 through MW-3 and three piezometers (P-1 and P-3) during the November 2004, and from the March 2005 sampling event. Historical groundwater data obtained from Amoco in 1991, which showed methylene chloride detected in well OW-1 at 1,100,000 micrograms per liter (ug/L), located south of ECI well MW-2. The current groundwater results do not indicate that methylene chloride was detected in the water samples collected from the ECI parking lot.
- No concentrated sources of VOCs originating from the Site are indicated by groundwater samples (i.e., lack of methylene chloride).

7.2 RECOMMENDATIONS

Based on the above data collected from this Phase II subsurface investigation, and on the fact that no concentrated sources of VOCs originate from the Site, Earth Tech recommends no further action is needed.

8.0 REFERENCES

AEI Consultants, Phase II Subsurface Investigation, ECI Facility, October 1999

Amoco Corporation Notification and Groundwater Contamination letter to LARWQCB, dated August 27, 1992

California Department of Toxic Substances Control and Los Angeles Regional Water Quality Control Board, January 28, 2003, Advisory – Active Soil Gas Investigations.

California Department of Water Resources, dated 1961.

California Regional Water Quality Control Board, Los Angeles Region, 1995. Interim Site Assessment and Cleanup Guidebook, dated February 1995.

Earth Tech, Subsurface Investigation Workplan, ECI Facility, dated December 2004

GeoEngineers, Phase II Environmental Site Assessment (ESA), RES property, dated December 1993,

Reidel Environmental Services, Subsurface Environmental Assessment Phase II, dated 1988

Reidel Environmental Services, Environmental Site Assessment, dated July 1994

Los Angeles Regional Water Quality Control Board letter. dated August 10, 2004

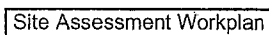
Los Angeles Regional Water Quality Control Board letter. dated September 14, 2004

Los Angeles Regional Water Quality Control Board letter. dated January 18, 2005

United States Environmental Protection Agency, 2004. Preliminary Remediation Goals for Region IX, dated October, 2004.

United States Geologic Survey, 1967. Photorevised 1973, 7.5 Minute Series, Topographic Map, Torrance, California Quadrangle

FIGURES



Final

Site Location Map

Ecology Control Inc., 1900 Normandie Ave; Torrance, California

Date: 11-04

Ecology Control Industries

Project No.

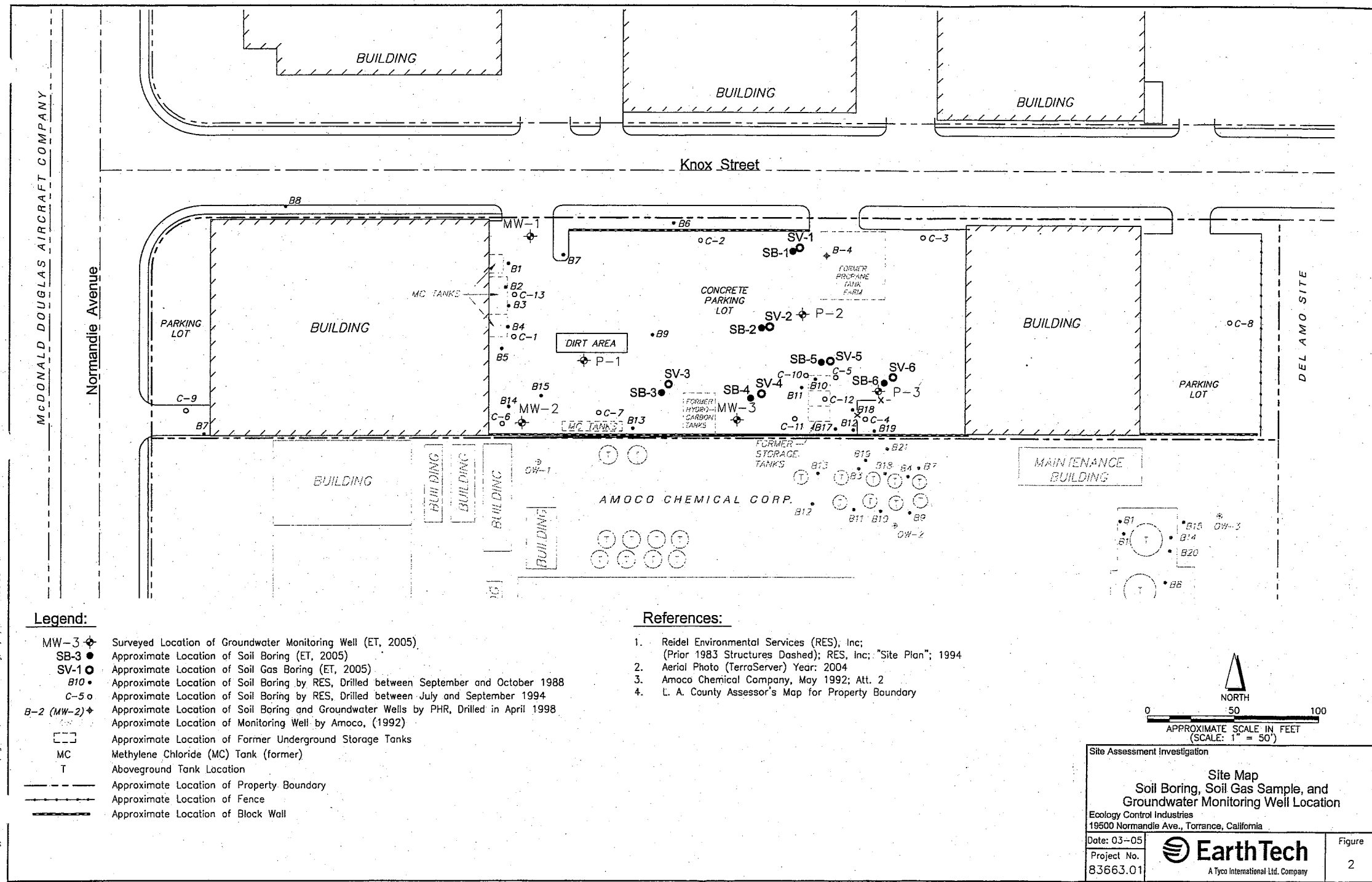


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Figure

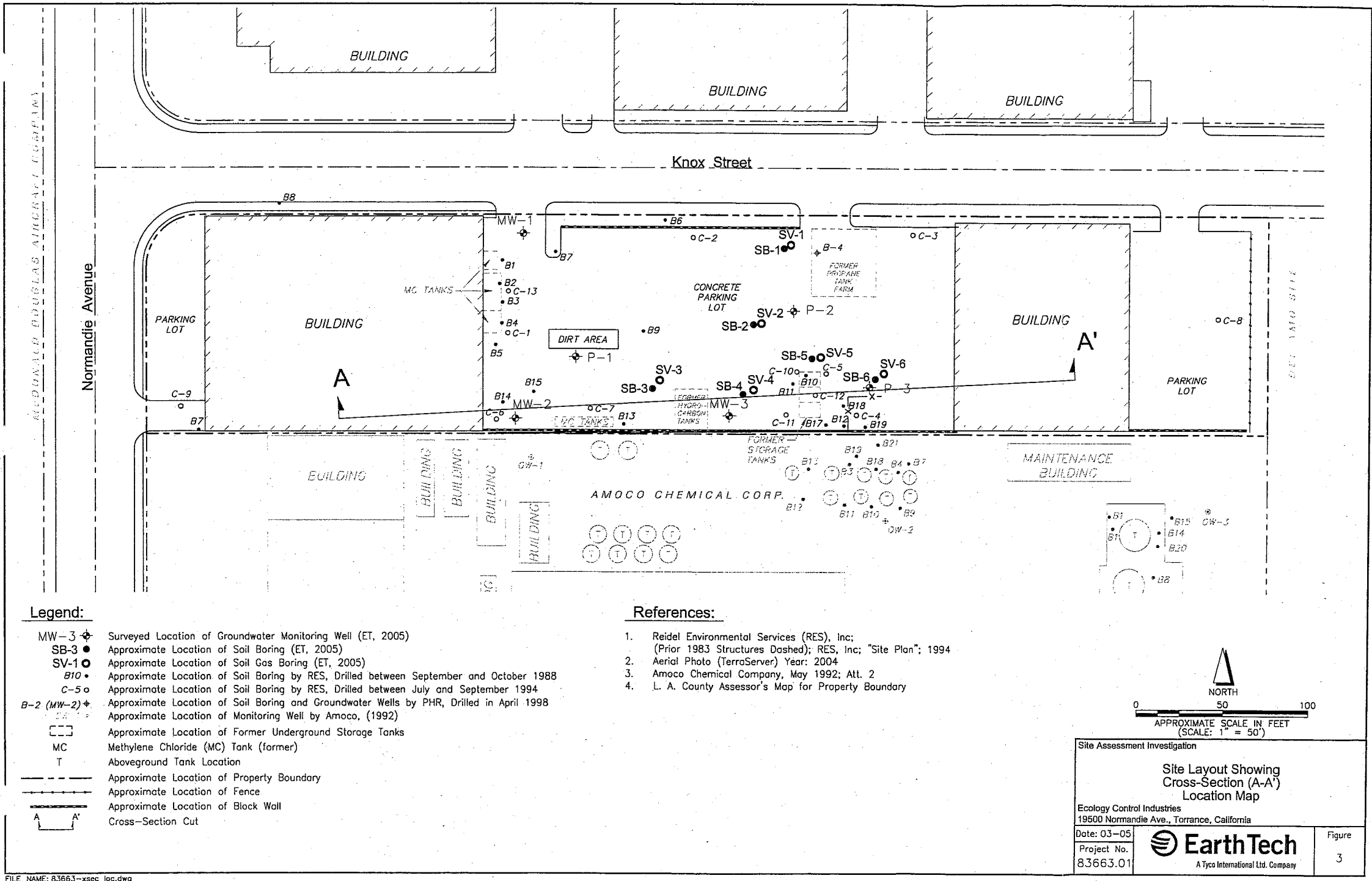
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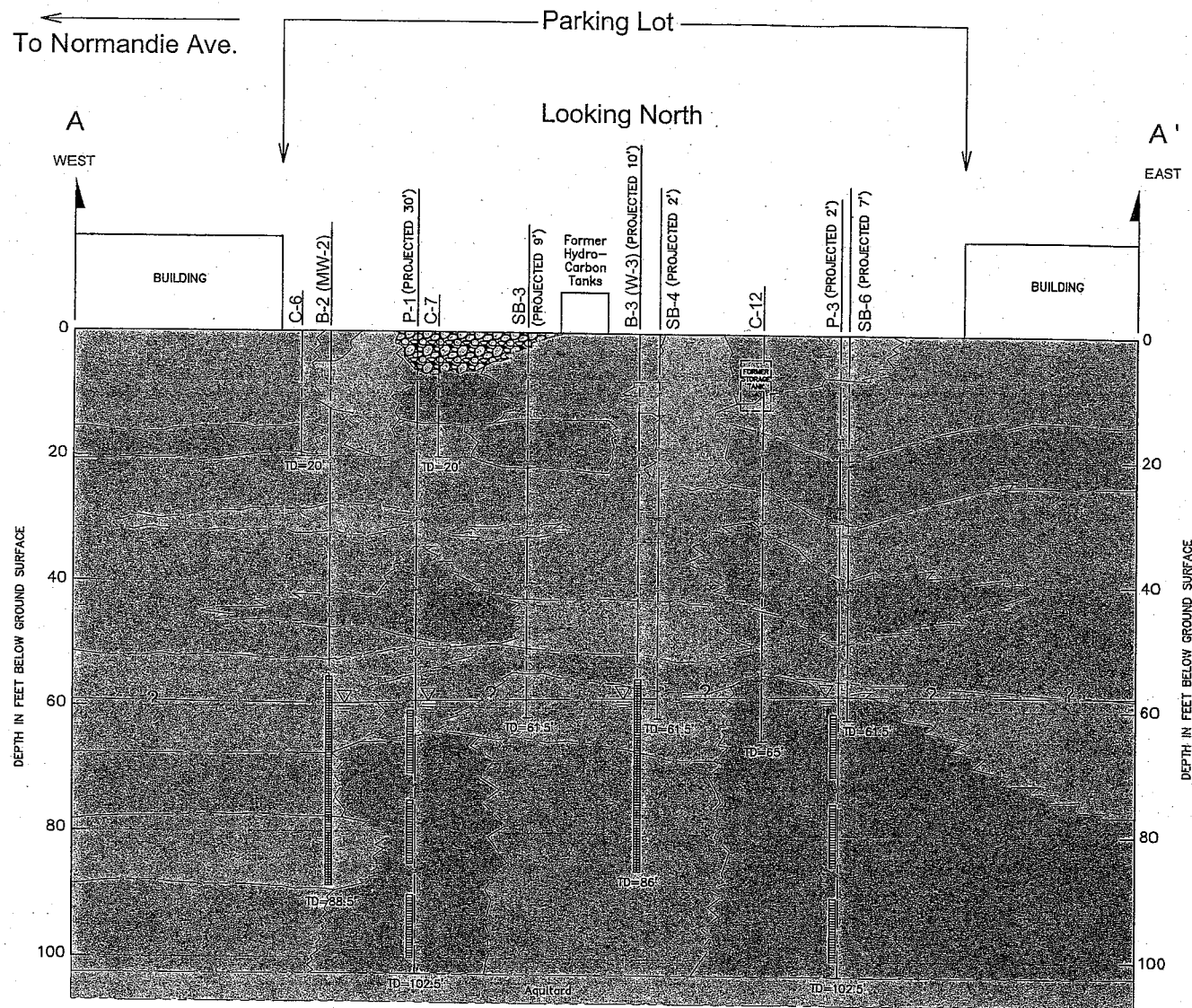
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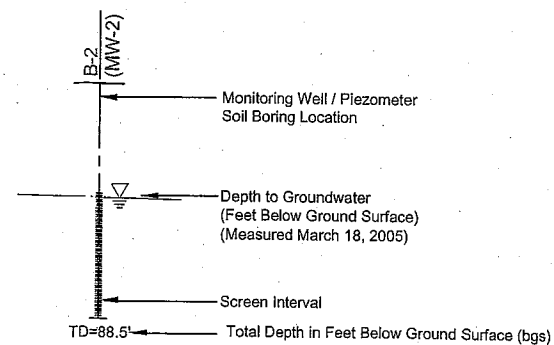
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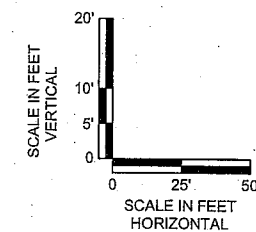
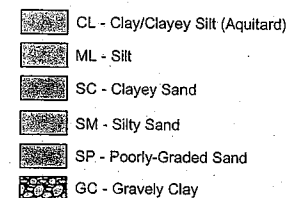




Legend:



USCS Soil Classification



Site Assessment Investigation

Geologic Cross-Section A-A'

Ecology Control Industries
19500 Normandie Ave., Torrance, California

Date: 03-05

Project No.
83663.01



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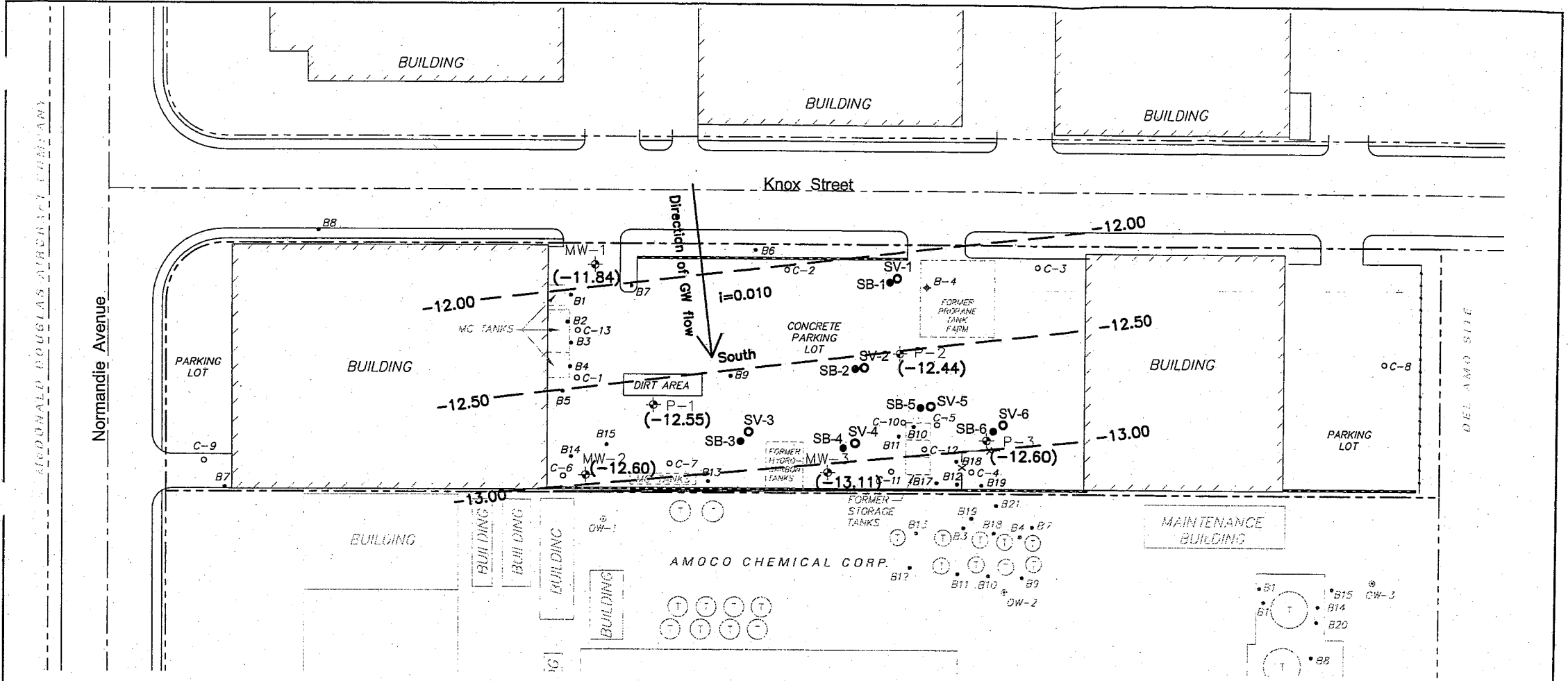
Figure

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Note: See Figure 3 for location of Cross-Section A-A'.

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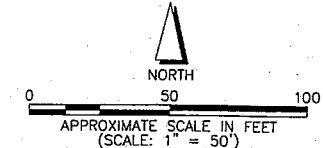



Legend:

- MW-3 ♦ Surveyed Location of Groundwater Monitoring Well
- SB-3 ● Approximate Location of Soil Boring (ET, 2005)
- SV-1 ○ Approximate Location of Soil Gas Boring (ET, 2005)
- B10 ● Approximate Location of Soil Boring by RES, Drilled between September and October 1988
- C-5 ○ Approximate Location of Soil Boring by RES, Drilled between July and September 1994
- B-2 (MW-2) ♦ Approximate Location of Soil Boring and Groundwater Wells by PHR, Drilled in April 1998
- Approximate Location of Former Underground Storage Tanks
- MC Methylene Chloride (MC) Tank (former)
- T Aboveground Tank Location
- - - Approximate Location of Property Boundary
- — — Approximate Location of Fence
- — — Approximate Location of Block Wall
- 11.84 - Groundwater Elevation Contour (feet b MSL)

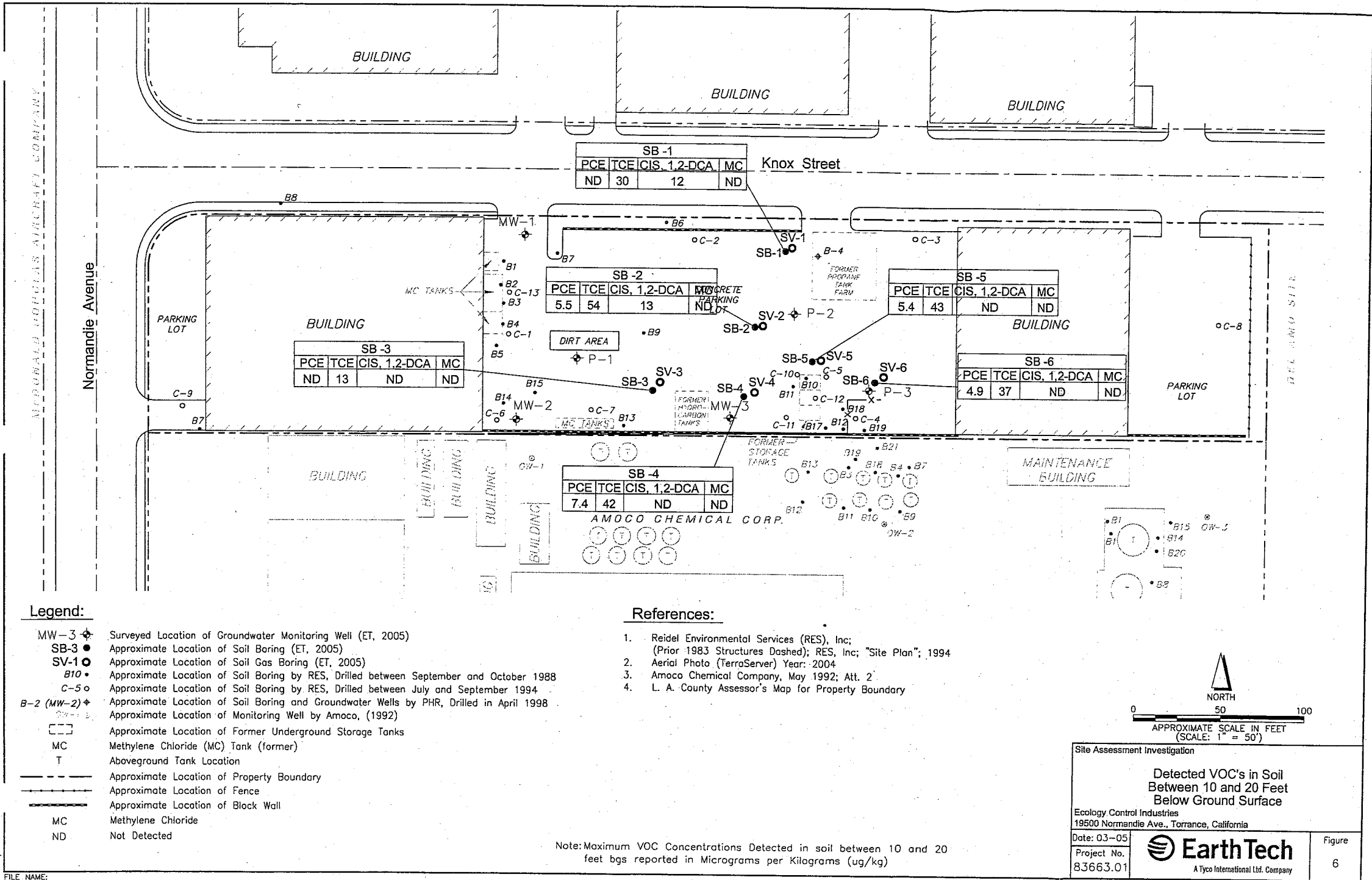
References:

1. Reidel Environmental Services (RES), Inc.; (Prior 1983 Structures Dashed); RES, Inc; "Site Plan"; 1994
2. Aerial Photo (TerraServer) Year: 2004
3. Amoco Chemical Company, May 1992; Att. 2
4. L. A. County Assessor's Map for Property Boundary



Site Assessment Investigation	
Groundwater Elevation Contour Map	
Ecology Control Industries 19500 Normandie Ave., Torrance, California	
Date: 03-05	 A Tyco International Ltd. Company
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Figure 5	

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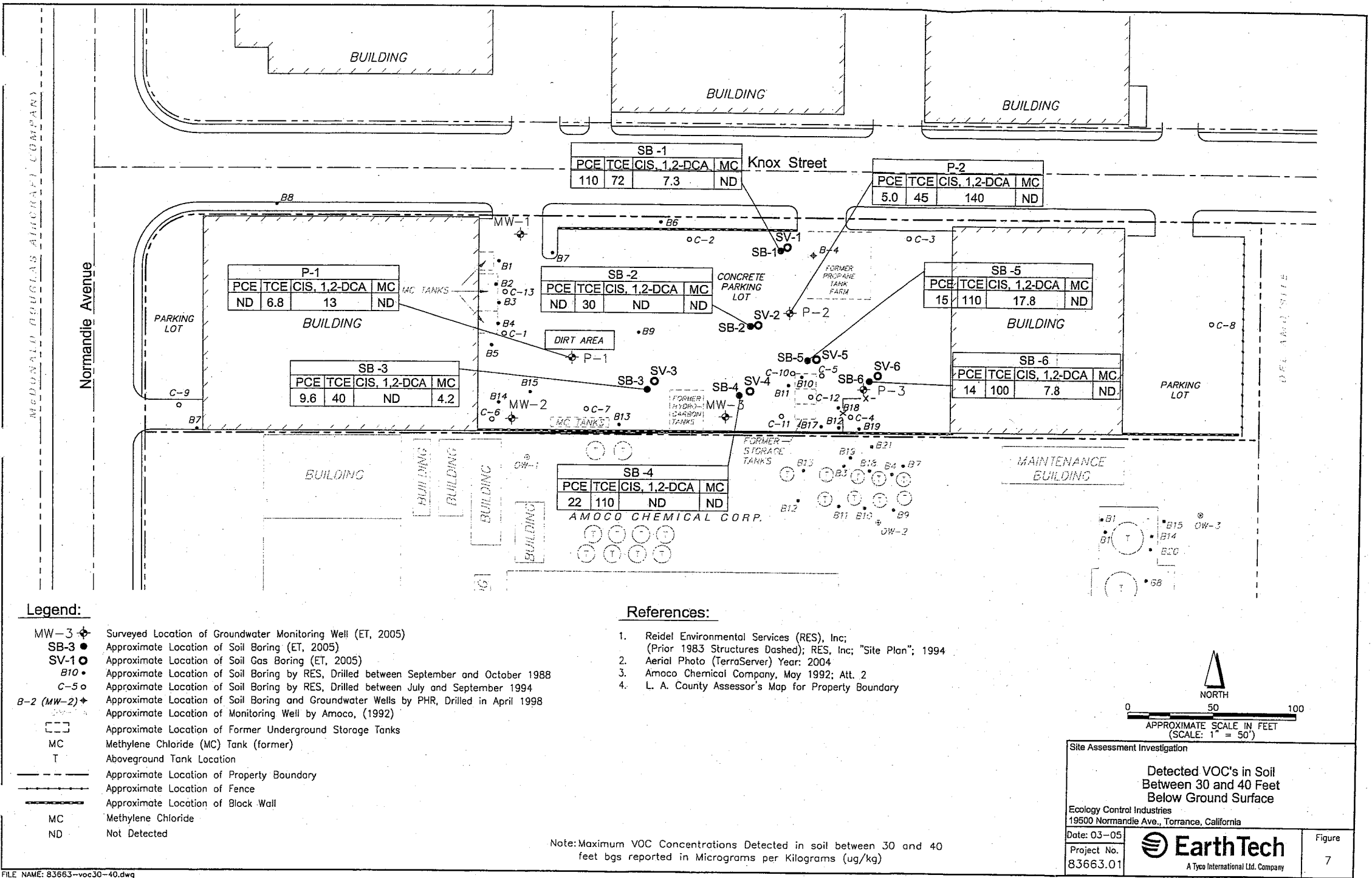
- MW-3 Surveyed Location of Groundwater Monitoring Well (ET, 2005)
SB-3 Approximate Location of Soil Boring (ET, 2005)
SV-1 Approximate Location of Soil Gas Boring (ET, 2005)
B10 Approximate Location of Soil Boring by RES, Drilled between September and October 1988
C-5 Approximate Location of Soil Boring by RES, Drilled between July and September 1994
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 Approximate Location of Monitoring Well by Amoco, (1992)
 Approximate Location of Former Underground Storage Tanks
MC Methylene Chloride (MC) Tank (former)
T Aboveground Tank Location
 Approximate Location of Property Boundary
 Approximate Location of Fence
 Approximate Location of Block Wall
MC Methylene Chloride
ND Not Detected

References:

1. Reidel Environmental Services (RES), Inc; (Prior 1983 Structures Dashed); RES, Inc; "Site Plan"; 1994
2. Aerial Photo (TerraServer) Year: 2004
3. Amoco Chemical Company, May 1992; Att. 2
4. L. A. County Assessor's Map for Property Boundary

Note: Maximum VOC Concentrations Detected in soil between 30 and 40 feet bgs reported in Micrograms per Kilograms (ug/kg)

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Site Assessment Investigation

Detected VOC's in Soil
Between 30 and 40 Feet
Below Ground Surface

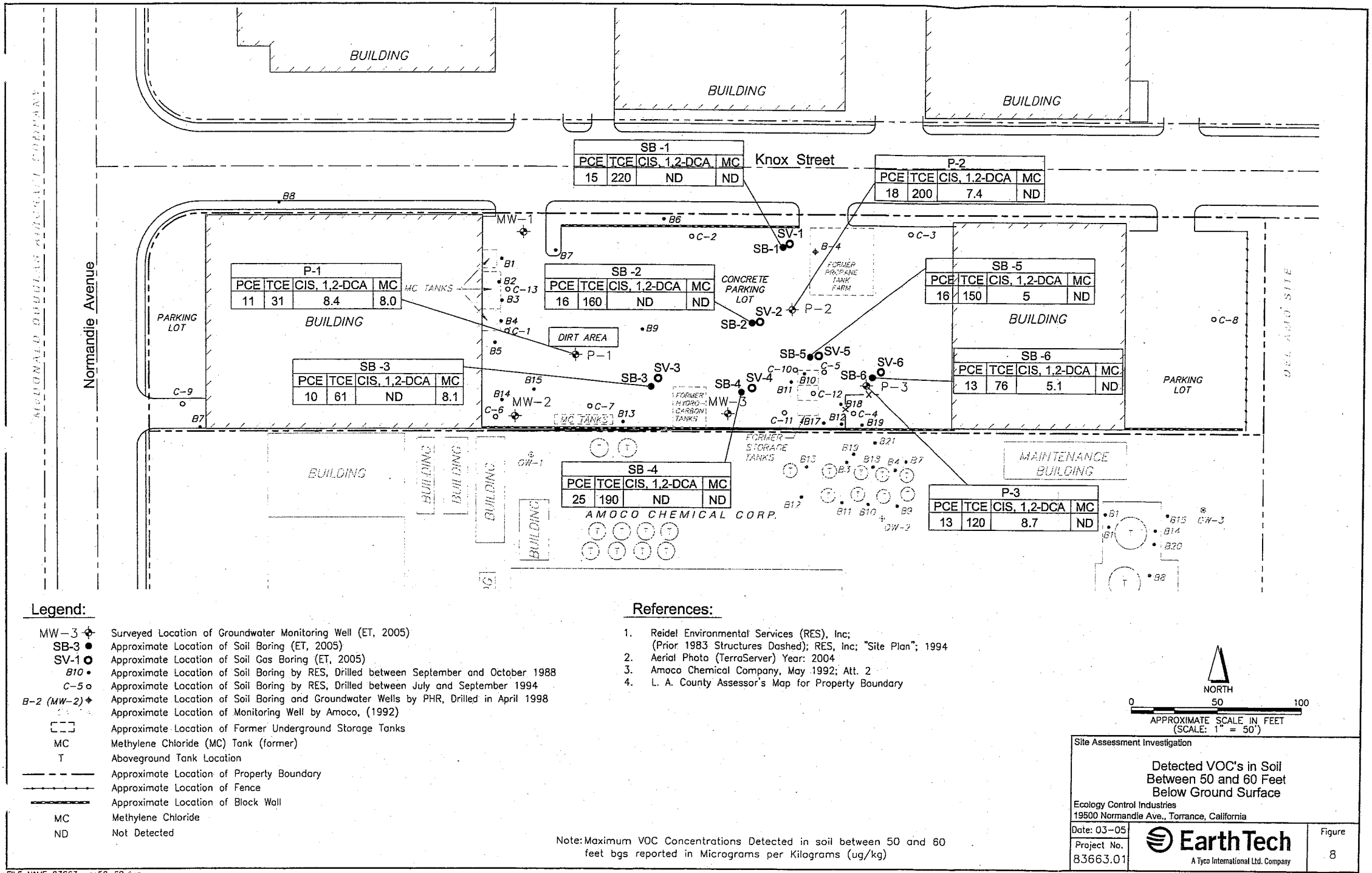
Ecology Control Industries
19500 Normandie Ave., Torrance, California

Date: 03-05
Project No. 83663.01

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Figure 7

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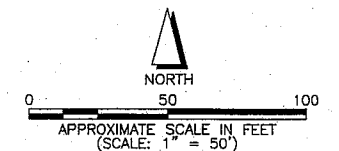
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- MW-3 ♦ Surveyed Location of Groundwater Monitoring Well (ET, 2005)
SB-3 ● Approximate Location of Soil Boring (ET, 2005)
SV-1 ○ Approximate Location of Soil Gas Boring (ET, 2005)
B10 • Approximate Location of Soil Boring by RES, Drilled between September and October 1988
C-5 ○ Approximate Location of Soil Boring by RES, Drilled between July and September 1994
B-2 (MW-2) ♦ Approximate Location of Soil Boring and Groundwater Wells by PHR, Drilled in April 1998
Approximate Location of Monitoring Well by Amoco, (1992)
MC □ Approximate Location of Former Underground Storage Tanks
T □ Aboveground Tank Location
--- Approximate Location of Property Boundary
--- Approximate Location of Fence
--- Approximate Location of Block Wall
ND Not Detected
ug/L Micrograms per liter

cDCE c-1, 2-Dichloroethene
tDCE t-1, 2-Dichloroethene
PCE Tetrachloroethene
TCE Trichloroethene
TCFE Trichlorofluoromethane
VOCs Volatile Organic Compounds

References:

1. Reidel Environmental Services (RES), Inc; (Prior 1983 Structures Dashed); RES, Inc; "Site Plan"; 1994
2. Aerial Photo (TerraServer) Year: 2004
3. Amoco Chemical Company, May 1992; Att. 2
4. L. A. County Assessor's Map for Property Boundary



Site Assessment Investigation

Groundwater Sampling Results EPA Method 8260B March 18, 2005

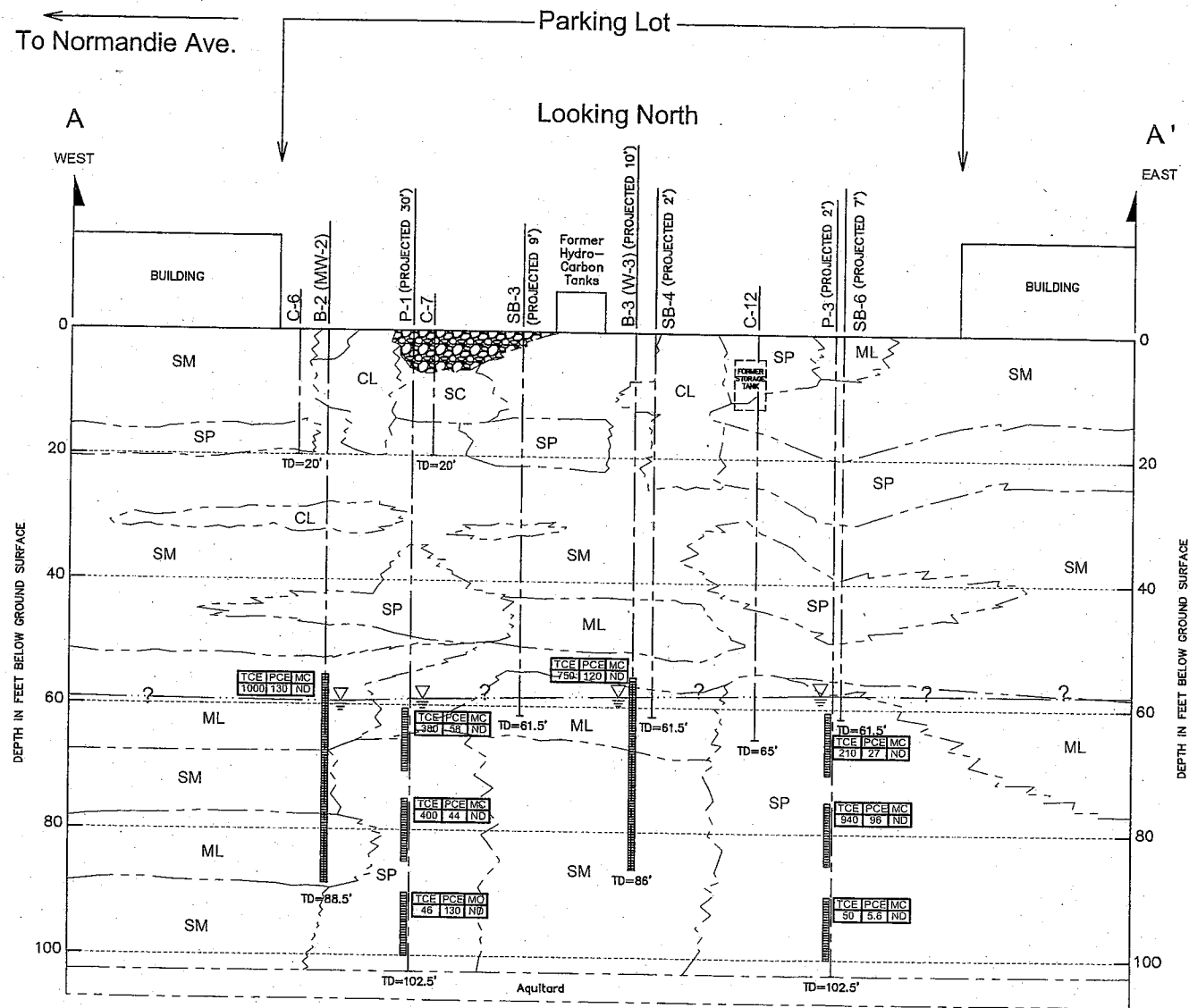
Ecology Control Industries
19500 Normandie Ave., Torrance, California

Date: 03-05
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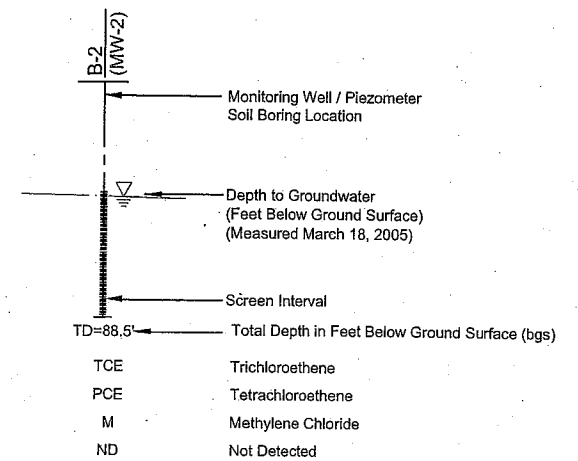
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Figure
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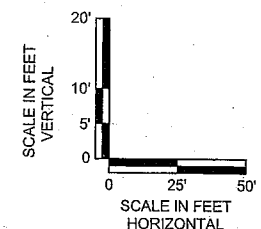
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Note: Concentrations in groundwater reported in ug/L



Note: See Figure 3 for location of Cross-Section A-A'.

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Site Assessment Investigation

Cross-Section Showing Detected
TCE, PCE, & Methylene Chloride in Groundwater

Ecology Control Industries
19500 Normandie Ave., Torrance, California

Date: 03-05

Project No.
83663.01

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Figure

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